CLAIMS

1. An angular velocity sensor comprising:

an oscillator;

a driving portion provided on the oscillator for driving the oscillator in an X-axis direction and a Z-axis direction;

a first driving circuit for supplying a driving signal for driving the oscillator in the X-axis direction to the driving portion;

a second driving circuit for supplying a driving signal for driving the oscillator in the X-axis direction and the Z-axis direction to the driving portion;

a detecting portion provided on the oscillator for detecting deflection of the oscillator during oscillation in the Z-axis direction;

an angular velocity detection circuit for outputting an angular velocity signal by amplifying and detecting a signal output from the detecting portion when the driving signal is supplied from the first driving circuit to the driving portion and an angular velocity is input about a Y-axis; and

a self diagnosis circuit for outputting a signal enabling failure diagnosis on the detecting portion by amplifying and detecting a signal output from the detecting portion when the driving signal is supplied from the second driving circuit to the driving portion.

2. The angular velocity sensor of Claim 1, wherein:

the oscillator is a tuning fork type oscillator made of an elastic material and having at least two arms and at least one base portion connecting the arms;

the driving portion includes a piezoelectric film on which at least upper electrodes are spaced from each other across the center of at least one principal surface of at least one of the arms of the tuning fork type oscillator;

the detecting portion includes a piezoelectric film provided on at least one principal surface of at least one of the arms of the tuning fork type oscillator and having an electrode on both sides thereof;

driving signals which are inverted from each other in phase are supplied from the first driving circuit to the upper electrodes spaced from each other to cause tuning fork oscillation in the X-axis direction; and

driving signals which are inverted from each other in phase and different in amplitude are supplied from the second driving circuit to the upper electrodes spaced from each other to cause tuning fork oscillation in the X-axis direction and oscillation also in the Z-axis direction.

3. The angular velocity sensor of Claim 1, wherein:

the oscillator is a tuning fork type oscillator made of an elastic material and having at least two arms and at least one base portion connecting the arms;

the driving portion includes a pair of piezoelectric films spaced from each other across the center of at least one principal surface of at least one of the arms of the tuning fork type oscillator, the films having an electrode on each of the top and bottom thereof;

the detecting portion includes a piezoelectric film provided on at least one principal surface of at least one of the arms of the tuning fork type oscillator and having an electrode on both sides thereof;

driving signals which are inverted from each other in phase are supplied from the first driving circuit to the upper electrodes spaced from each other to cause tuning fork oscillation in the X-axis direction; and

driving signals which are inverted from each other in phase and different in amplitude are supplied from the second driving circuit to the upper electrodes spaced from each other to cause tuning fork oscillation in the X-axis direction and oscillation also in the Z-axis direction.

4. The angular velocity sensor of Claim 1, wherein:

the oscillator is a tuning fork type oscillator made of an elastic material and having at least two arms and at least one base portion connecting the arms;

the driving portion includes first and second piezoelectric films which are provided on the two arms of the tuning fork type oscillator and on which at least upper

electrodes are spaced from each other across the center of one principal surface of each arm, a difference being provided at least between the surface areas of the upper electrodes on the respective arms;

the detecting portion includes a piezoelectric film provided on at least one principal surface of at least one of the arms of the tuning fork type oscillator and having an electrode on both sides thereof;

driving signals which are inverted from each other in phase are supplied from the first driving circuit to the upper electrodes provided on the first and second piezoelectric films, respectively, and spaced from each other to cause tuning fork oscillation in the X-axis direction; and

driving signals which are inverted from each other in phase and different in amplitude are supplied from the second driving circuit to the upper electrodes provided on the first and second piezoelectric films, respectively, and spaced from each other to cause tuning fork oscillation in the X-axis direction and oscillation also in the Z-axis direction.

5. The angular velocity sensor of Claim 1, wherein:

the oscillator is a tuning fork type oscillator made of an elastic material and having at least two arms and at least one base portion connecting the arms;

the driving portion includes a pair of piezoelectric films which are provided on each of the two arms of the tuning fork

type oscillator and spaced from each other across the center of one principal surface of each arm and which have an electrode on each of the top and bottom thereof, a difference being provided at least between the surface areas of the top electrodes on the respective arms;

the detecting portion includes a piezoelectric film provided on at least one principal surface of at least one of the arms of the tuning fork type oscillator and having an electrode on both sides thereof;

driving signals which are inverted from each other in phase are supplied from the first driving circuit to the top electrodes provided on the respective pairs of piezoelectric films and spaced from each other to cause tuning fork oscillation in the X-axis direction; and

driving signals which are inverted from each other in phase and different in amplitude are supplied from the second driving circuit to the top electrodes provided on the respective pairs of piezoelectric films and spaced from each other to cause tuning fork oscillation in the X-axis direction and oscillation also in the Z-axis direction.

6. The angular velocity sensor of Claim 1, wherein:

the oscillator is a tuning fork type oscillator made of an elastic material and having at least two arms and at least one base portion connecting the arms;

the driving portion includes first and second

piezoelectric films which are provided on the two arms of the tuning fork type oscillator and on which at least upper electrodes are spaced from each other across the center of one principal surface of each arm, a difference being provided at least between the positions in the Y-axis direction of the upper electrodes on the respective arms;

the detecting portion includes a piezoelectric film provided on at least one principal surface of at least one of the arms of the tuning fork type oscillator and having an electrode on both sides thereof;

driving signals which are inverted from each other in phase are supplied from the first driving circuit to the upper electrodes provided on the first and second piezoelectric films, respectively, and spaced from each other to cause tuning fork oscillation in the X-axis direction; and

driving signals which are inverted from each other in phase and different in amplitude are supplied from the second driving circuit to the upper electrodes provided on the first and second piezoelectric films, respectively, and spaced from each other to cause tuning fork oscillation in the X-axis direction and oscillation also in the Z-axis direction.

7. The angular velocity sensor of Claim 1, wherein:

the oscillator is a tuning fork type oscillator made of an elastic material and having at least two arms and at least one base portion connecting the arms;

the driving portion includes a pair of piezoelectric films which are provided on each of the two arms of the tuning fork type oscillator and spaced from each other across the center of one principal surface of each arm and which have an electrode on each of the top and bottom thereof, a difference being provided at least between the positions of the top electrodes on the respective arms in the Y-axis direction;

the detecting portion includes a piezoelectric film provided on at least one principal surface of at least one of the arms of the tuning fork type oscillator and having an electrode on both sides thereof;

driving signals which are inverted from each other in phase are supplied from the first driving circuit to the top electrodes provided on the respective pairs of piezoelectric films and spaced from each other to cause tuning fork oscillation in the X-axis direction; and

driving signals which are inverted from each other in phase and different in amplitude are supplied from the second driving circuit to the top electrodes provided on the respective pairs of piezoelectric films and spaced from each other to cause tuning fork oscillation in the X-axis direction and oscillation also in the Z-axis direction.

8. The angular velocity sensor of Claim 1, which also has the functions of the angular velocity detection circuit and the self diagnosis circuit.

9. The angular velocity sensor of any of Claims 2 to 7, comprising a check terminal to which a check signal is input from outside of the angular velocity sensor to carry out the failure diagnosis, wherein means for generating a difference in amplitude between the driving signals according to an output signal from the check terminal is provided in the second driving circuit.